Grade 4 Target C
Domain, Target, Standards, DOK, Vertical Alignments, Achievement Levels, Evidence Required, Vocabulary, Response Types, Materials, Attributes, Question Types, and Question Banks (Examples)

Content Domain: Operations and Algebraic Thinking

Target C [s]: 4.OA.C Generate and analyze patterns.

Standards included in Target C: 4.OA.A.5

4.OA.C Generate and analyze patterns.

4.OA.C.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

Vertical Alignment

Related Grade 3 standards

3.OA.D Solve problems involving the four operations, and identify and explain patterns in arithmetic.

3.OA.D.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

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Related Grade 5 Standards

5.OA.B Analyze patterns and relationships.

5.OA.B.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.

Achievement Level Descriptors

Level 1 Students should be able to extend a number or shape pattern that follows a given rule.
Level 2 Students should be able to generate a number or shape pattern that follows a given rule.
Level 3 Students should be able to analyze a pattern for apparent features that are not explicit in the rule itself.
Level 4 No Descriptor.

Evidence Required

1. The student generates number patterns.

2. The student generates shape patterns.

3. The student analyzes a number pattern or shape pattern, showing understanding of the pattern rule and features other than the pattern rule.

Vocabulary
pattern

Response Types
Drag and Drop; Hot Spot; Fill-in Table; Matching Tables; Equation/Numeric; Multiple Choice, single correct response

Materials
whole number patterns using all four operations, fraction patterns using addition and subtraction with like denominators (limited to denominators of 2, 3, 4, 5, 6, 8, 10, 12 and 100), shape patterns with two-dimensional figures or pictures of objects
Limitations on numbers in number patterns:
 • Multiplication should never exceed 4-digit by 1-digit or 2-digit by 2-digit.
 • Multiplication should never involve decimals, but may involve multiplying a whole number by a fraction.
 • Division should never exceed 4-digit by 1-digit.
 • Division should never involve fractions or decimals.

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<u>*Claim 1: Concepts and Procedures (DOK 2, 3) Question Banks*</u>
Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Claim 1 4.OA.C.5 DOK Level 2

Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

Evidence Required
The student generates number patterns.

Question Type 1: The student is presented with a number pattern rule and starting number.

A pattern is generated using this rule: Start with the number 7 as the first term and add 5.

Term	Number
First	7
Second	
Third	
Fourth	
Fifth	

Rubric: (1 point) The student enters the correct numbers (e.g., 12, 17, 22, 27).
Response Type: Fill-in Table

Claim 1 4.OA.C.5 DOK Level 2

Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear

to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

Evidence Required
The student generates shape patterns.

Question Type 1:
The student is presented with a shape pattern rule.

A shape pattern is generated by repeating the pattern of "Star, Circle, Circle."
Click in the table to show the first six terms of the pattern, starting with Star.

Terms	Star	Circle
First term		
Second term		
Third term		
Fourth term		
Fifth term		
Sixth term		

Rubric: (1 point) The student correctly identifies the first six terms of the pattern (e.g., Star, Circle, Circle, Star, Circle, Circle).
Response Type: Matching Tables

Question Type 2: The student is presented with a shape pattern rule.

Evidence Required
The student generates number patterns.

A shape pattern is generated by repeating the pattern of "Star, Circle, Square, Triangle" as shown.

☆	◯	☐	△	☆	◯	☐	△
First term	Second term	Third term	Fourth term	Fifth term	Sixth term	Seventh term	Eighth term

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This pattern continues for 100 terms. Select the shape that represents the 98th term.

A. ☆

B. ○

C. ☐

D. △

Rubric: (1 point) The student correctly identifies the indicated term (e.g., B).
Response Type: Multiple Choice, single correct response

Claim 1 4.OA.C.5 DOK Level 3

Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

Evidence Required
The student analyzes a number pattern or shape pattern, showing understanding of the pattern rule and features other than the pattern rule.

Question Type 1:
The student is presented with a number pattern rule and starting number.

A pattern is generated using this rule: Start with the number 5 as the first term and add 2. Select True or False for each statement about the pattern.

Term descriptions	True	False
The terms alternate between even and odd numbers.		
Each term is greater than the term before it.		
All possible multiples of 5 are		

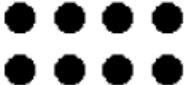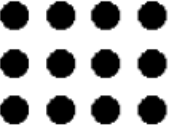These pages were adapted from open source documents available on the Smarter Balanced Website: http://www.smarterbalanced.org/assessments/development/ August 2016

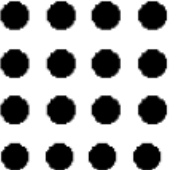| Term descriptions	True	False
terms in the pattern.		

Rubric: (1 point) The student correctly identifies all three statements as True or False (e.g., F, T, F).
Response Type: Matching Tables

Question Type 2: The student is presented with a shape pattern rule.

The first four terms of a shape pattern are shown. Each term is generated by following the same rule.

First term
(4 dots)

Second term
(8 dots)

Third term
(12 dots)

Fourth term
(16 dots)

Decide whether each statement can be used to describe the dot pattern shown. Select Yes or No for each statement.

Pattern Statements	Yes	No
The difference between the number of dots in each term is 8.		
The number of dots in the 7th term is 28.		
The digit in the ones place of the number of dots repeats in the following pattern: 4, 8, 2, 6, 0.		

Rubric: (1 point) The student correctly selects yes or no for each method (e.g., N, Y, Y).
Response Type: Matching Tables

Question Type 3: The student is presented with a rule and starting number.

A pattern is generated using this rule: Start with 42 and add 5. Enter one number in each response box that makes this sentence correct: The ones digit for every term in the pattern is either ___ or ___.

Rubric: (1 point) The student correctly names the values between which the identified place's digits alternate (e.g., 2, 7).
Response Type: Equation/Numeric (2 response boxes)

Question Type 4: The student is presented with a rule and starting number.

A pattern is generated using this rule: Start with the number 7 as the first term and add 5.

Part A: Drag numbers into the boxes to show the next six terms of this pattern.

7						
First term	Second term	Third term	Fourth term	Fifth term	Sixth term	Seventh term

Part B: Based on what you observe about the first seven terms, which numbers below are also in the pattern? Select all of the numbers that are in the pattern.

377   955   1022   9992

Interaction: In Part A, the student drags digits 0-9 to boxes to create the next six terms in the number pattern. In Part B, the student clicks on the numbers that are in the pattern.

Rubric:
Part A: (1 point) The student correctly names the next six terms of the pattern (e.g., 12, 17, 22, 27, 32, 37).
Response Type: Drag and Drop

Part B: (1 point) The student correctly identifies other terms from the pattern (e.g., 377, 1022, 9992).
Response Type: Hot Spot